

INTEGRATION OF SPHERICAL FUZZY-AHP AND OPARA METHOD FOR ROBUST MULTI-CRITERIA DECISION-MAKING

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Highlights

- *Approach*: Innovative as SF-OPARA integrates OPARA with SFS for complex scenarios, capturing all aspects in one framework.
- *Reliability*: SF-OPARA exhibits superior dependability to traditional methods, as demonstrated in the case study.
- *Applicability*: The handling of subjective data by SF-OPARA enhances broader decision-making and precision.

ABSTRACT

This study introduces "Spherical Fuzzy-Objective Pairwise Ratio Analysis (SF-OPARA)", a novel decision-making method that integrates OPARA with Spherical Fuzzy Sets (SFS) to address complex and uncertain scenarios. SF-OPARA overcomes the limitations of traditional methods that struggle with ambiguous data by combining OPARA's objective structure with the flexibility of SFS. This integration captures membership, non-membership, and hesitancy within a single framework, enhancing effectiveness in uncertain conditions. A case study demonstrates SF-OPARA's superior reliability to traditional and fuzzy Multi-criteria Decision-Making (MCDM) methods, providing detailed and practical rankings under uncertainty. SF-OPARA aligns decision-making with real-world needs by converting expert judgments into precise, actionable insights. Its unique handling of subjective data makes it a valuable tool across various fields, including public policy, resource management, and strategic planning. This approach enhances decision-making flexibility and precision, aiding organizations in making well-informed choices that reflect real-world complexities. SF-OPARA's broad applicability significantly adds to decision support tools, especially in uncertain environments. This study is the first to apply Spherical Fuzzy Sets within the OPARA framework, filling a notable gap in MCDM research and advancing the development of tools for complex decision challenges.

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